Designing nanoparticles during the drawing step

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DESIGNING NANOPARTICLES DURING THE DRAWING STEP

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Nanoparticles in the core of optical fibres are widely studied due to the opportunity they give to tailor spectroscopic properties. Such fibres are usually obtained by drawing at high temperature a preform containing nanoparticles [1]. This study focuses on the effect of the fibre drawing on nanoparticles. We fabricated an MCVD optical preform by doping the porous layer with nanoparticles. The optical fibre was studied by a FIB/SEM tomography [2].

Figure 1 is the volume reconstruction of the core of the optical fibre. The yellow phase represents nanoparticles inside the core of the optical fibre. This reconstruction shows evidences of break-up, elongation and coalescence of particles [3]. These features will be discussed according to phenomena well known from the rheology of emulsions and polymers [4]. It comes from a competition between viscous stresses of the flow and surface tension.

Observation of these size-controlling phenomena occuring during fibre drawing offer new perspectives to tailor the size of nanoparticles and are therefore of great interest for light scattering issues.

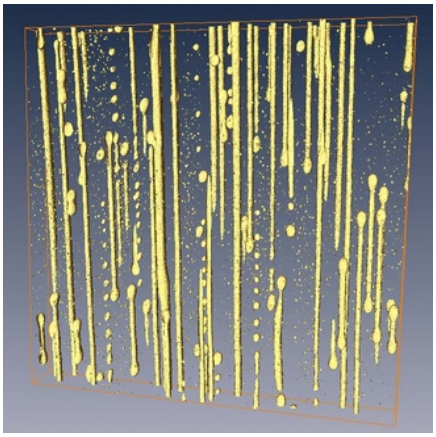

Figure 1: 3D rendering of the particles in the core of the optical fibre. The drawing direction is vertical. Width of the volume reconstructed by the FIB/SEM process is 5 µm.

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